Application No.: 10/674,250
Amendment dated: 03/08/05
Reply to Office Action mailed: 12/17/04

Remarks/Arguments

The rejection of Applicants' claims 12 and 24 under 35 U.S.C. 102(e) as anticipated by U.S. Patent 6,449,984B1 issued September 17, 2002 to Henri Paradowski is believed fully obviated by the foregoing amendments wherein Applicants have canceled claims 12 and 24.

The rejection of Applicants' claims 1, 2, 4-6, 9, 10-14 and 22-24 under 35 U.S.C. 102(b) as anticipated by the Bauer article is respectfully traversed and reconsideration is respectfully requested.

Applicants' invention, as presently claimed, is an improved efficiency, reduced carbon dioxide emissions method for providing power for refrigerant compression and shared electrical power for a light hydrocarbon gas liquefaction process. Applicants' claimed method consists essentially of providing at least a portion of the electrical power for the light hydrocarbon gas liquefaction process from at least one electrical generator driven by at least one fossil fuel fired turbine, which is fueled by a compressed air stream and a light hydrocarbon gas stream and produces a high-temperature, high-pressure gas stream to power the turbine and discharge a high-temperature exhaust gas stream. The exhaust gas stream is then passed to heat exchange with water or low-pressure steam to produce a high-pressure steam stream, which is then used to generate additional electrical power by a second electrical generator. The electrical power generated by the two generators is used to power at least one refrigerant compressor driven by an electric motor powered by the generated power to compress a low-pressure refrigerant to an increased pressure. The electrical power generated is also desirably sufficient for shared electrical power for other uses in the light hydrocarbon liquefaction process facility.

Bauer discloses no more than that electrical motors should be used to drive compressors for a light hydrocarbon gas liquefaction process. The reference discusses the use of combined cycle power plants but does not address the desirability of having onsite power generation capability from fossil fueled turbines as discussed by Applicants specifically in paragraph 0015 – 0020. As pointed out, the use of the fossil fuel fired

turbines permits greater flexibility in the generation of electrical power to add capacity or replace failed capacity than does the use of fossil fueled turbines to drive the compressors. The fossil fueled turbines are much more easily started to drive electrical generators than to drive compressors. It is also much more feasible to maintain a stand-by fossil fueled turbine with a generator than it is to maintain alternate turbines and compressors.

Accordingly, considerable efficiency is achieved simply by having the fossil fueled turbines available to produce electrical power and to supplement the electrical power as required. Further the use of the fossil fueled turbines in this fashion permits the recovery of additional electrical power from the exhaust gas streams from the fossil fueled turbines to produce additional electricity thereby improving the process efficiency and resulting in up to about a 60 percent reduction in the amount of carbon dioxide emitted to the atmosphere by comparison to a process which uses light hydrocarbon gas fueled turbines to drive refrigerant compressors with exhaust gas then being discharged to the atmosphere without heat recovery and by comparison to electrical power generated by combustion of fossil fuels without heat recovery on or off site. This reduction is significant since it is considered that carbon dioxide is a significant air pollutant.

The combination of these steps is not considered to be shown in Bauer, who simply shows a combined cycle plant off site in combination with electrically driven compressors. There is no suggestion of the efficiencies achieved by Applicants combination of fossil fuel turbines with electrically driven turbines to produce power for the light hydrocarbon liquefaction facility with reduced carbon dioxide emissions and with the increased process flexibility and efficiency achieved by Applicants.

Accordingly, it is respectfully submitted that Bauer does not show or suggest Applicants claimed invention as presently claimed in claims 2, 9, 11, 13 and 14.

Claims 1, 4-6, 10, 12 and 22-24 have been canceled.

It is respectfully submitted that this reference taken alone or in combination with any of the other references still fails to show or suggest any of Applicants' claims as presently amended.

The rejection of Applicants' claims under 35 U.S.C. 102(e) as anticipated by U.S. Patent 6,658,891B2 issued December 9, 2003 to Duncan Reijnen, et al (Reijnen) is respectfully traversed and reconsideration is respectfully requested. Reijnen also discloses simply the use of electrical motors to drive compressors. There is no suggestion that synergistic results can be achieved by the use of fossil fueled turbines with recovery of electrical power from the hot exhaust gases from the fossil fueled turbine claimed by Applicants. As previously noted, the use of the fossil fueled turbines produces the electrical power required and produces a high-temperature exhaust gas, which while it is relatively low pressure, is readily used for heat exchange with water or low-pressure steam to produce high-pressure steam for use to drive a steam turbine to produce additional electrical power. The electrical power produced by the generators driven by the fossil fueled turbines and the electrical power produced by the generators driven by the steam driven turbines is sufficient to drive the refrigerant compressors to produced the desired compressed refrigerant for use in the light hydrocarbon liquefaction process.

As noted previously, the practice of Applicants' invention results in a reduction of up to about 60 percent in the amount of carbon dioxide emitted to the atmosphere and provides considerable operating flexibility which is not possible with either the use of the electrically driven turbines alone or the use of the fossil fuel driven turbines alone. These improvements have been discussed in Applicants' Specification and result in much greater process flexibility because of the increased ease of starting fossil fueled turbines connected to an electrical generator as opposed to a refrigerant compressor. This permits the quick start-up of additional electrical generating capacity since it is much more feasible to keep the fossil fueled turbines available than to keep stand-by electrically powered turbines available for the compressors.

Accordingly, it is respectfully submitted that Reijnen does not show or suggest Applicants' claimed invention, as presently claimed.

The rejection of Applicants' claims 3, 7, 8 and 15-21 under 35 U.S.C. 103 as unpatentable over the Bauer article in view of U.S. Patent 4, 907,405 issued March 13, 1990 to Robert J. Polizzotto (Polizzotto) is respectfully traversed and reconsideration is respectfully requested.

The Bauer reference has been discussed above and as noted is not considered to show or suggest Applicants' currently claimed invention. Polizzotto is considered to show a process which uses steam produced by a cogeneration facility to cool gas when steam is passed through an absorption chiller to cool water, which in turn is used to cool the gas. These operations are not commonly used in a light hydrocarbon liquefaction process and it is difficult to see how this reference has any relevance to any such processes. Accordingly, it is respectfully submitted that this reference, take alone or with the Bauer reference, fails to show or suggest any of Applicants' claims 3, 7, 8 and 15-21.

Applicants' claims have been amended to require that a high-temperature, high-pressure stream exiting the fossil fuel fired turbines is used to generate supplemental electrical power by generating steam, which is then passed to a steam turbine to drive a second electrical generator. This results in very efficient use of the steam to produce electrical power and results in a significant reduction in the amount of carbon dioxide emitted to the atmosphere.

As pointed out above, it also permits greater operating flexibility because of the greater ease of maintaining stand-by generator units which are fossil fueled turbine driven than stand-by units which are electrically powered. This operating flexibility is of great value in the practical operation of light hydrocarbon gas liquefaction processes. The reduction in the amount of carbon dioxide to the atmosphere is also highly beneficial.

Application No.: 10/674,250
Amendment dated: 03/08/05
Reply to Office Action mailed: 12/17/04

Accordingly, it is respectfully submitted in view of the foregoing comments that none of Applicants' remaining claims, as amended, have been shown or suggested by any of the references cited, taken alone or in combination.

The remaining references have been reviewed, but since they are not considered to show or suggest Applicants' claimed invention and since they have not been applied by the Examiner, no further discussion of these references is considered necessary.

In view of the foregoing amendments and comments, it is respectfully submitted that Applicants' claims are now in condition for allowance and such is respectfully solicited.

Respectfully submitted,

F. Lindsey Scott
Registration No. 26,230
972.599.2888
Attorney for Applicants

2329 Coit Road
Suite B
Plano, TX 75075-3796